

**Patent**

**Attorney Docket No.: 2855/110**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

APPLICANT : Xiaofang ZHANG et al.  
SERIAL NO. : 10/775,658  
FILED : February 9, 2004  
FOR : ELECTRICAL CURRENT MEASUREMENTS AT  
HEAD-DISK INTERFACE  
GROUP ART UNIT : 2627  
EXAMINER : Varsha A. KAPADIA  
CUSTOMER NO. : 25693

M/S: APPEAL BRIEF – PATENTS  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**ATTENTION: Board of Patent Appeals and Interferences**

**APPEAL BRIEF**

Dear Sir:

This brief is in furtherance of the Notice of Appeal, filed in this case on February 12, 2008.

**1. REAL PARTY IN INTEREST**

The real party in interest in this matter is SAE Magnetics (H.K.) Ltd. (Recorded February 9, 2004; Reel/Frame 014983/0450).

**2. RELATED APPEALS AND INTERFERENCES**

There are no related appeals. An Appeal Brief was filed in this case on July 31, 2006.

**3. STATUS OF THE CLAIMS**

Claims 1-17 are pending. Claims 1-6 and 8-17 are rejected. Claims 7 was previously cancelled. No claims are allowed, objected to, or withdrawn. No amendments to the claims were included in the after-final response dated January 14, 2008; the proposed cancellation of claim 13 was not entered. *See* Advisory Action dated 2/4/2008. The claims in their current form (including those claims under appeal) are presented in the Appendix – Section 8 Claims on Appeal.

**4. STATUS OF AMENDMENTS**

The claims listed on page A-1 of the Appendix attached to this Appeal Brief reflects the present status of the claims.

## 5. SUMMARY OF THE CLAIMED SUBJECT MATTER

The present invention pertains to a method and apparatus for measuring current in hard disk drives and the like. More particularly, the present invention pertains to measuring electric current between a magnetic recording head and the recording medium.

The embodiment of claim 1 generally describes an apparatus, comprising a current measurement device (*see e.g.*, paragraph [0025] – Figure 3, element 309), a head gimbal assembly including a head to at least one of read and write information signals (*see e.g.*, paragraph [0026] – Figure 3, element 305) from/to a moving storage medium (*see e.g.*, paragraph [0027] – Figure 3, element 303), said current measurement device electrically coupled to said head and said storage medium (*see e.g.*, paragraphs [0026-27]), and wherein said current measurement device is to measure current between said head and said storage medium (*see e.g.*, paragraph [0027], lines 1-2) wherein said current measurement device is an ammeter/voltage source (*see e.g.*, paragraph [0028], line 1).

The embodiment of claim 3 generally describes an apparatus to measure contact between a magnetic recording head and a storage medium, comprising a current measurement device (*see e.g.*, paragraph [0025] – Figure 3, element 309), a head gimbal assembly including a magnetic recording head (*see e.g.*, paragraph [0026] – Figure 3, element 305), said recording head electrically coupled to said current measurement device (*see e.g.*, paragraphs [0026-27]), and a storage medium coupled to said current measurement device (*see e.g.*, paragraph [0027] – Figure 3, element 303), and wherein said current measurement device to measure current between said magnetic recording head and said storage medium (*see e.g.*, paragraphs [0026-27]) wherein said current measurement device is an ammeter/voltage source (*see e.g.*, paragraph [0028], line 1).

The embodiment of claim 15 generally describes a method of determining flying height characteristics for a disk drive comprising coupling a current measurement device (*see e.g.*, paragraph [0025] – Figure 3, element 309) to a head of a head gimbal assembly (*see e.g.*, paragraph [0026] – Figure 3, element 305), said head to at least one of read and write information signals from/to a moving storage medium (*see e.g.*, paragraph [0027] – Figure 3, element 303), coupling said current measurement device to a said storage medium (*see e.g.*, paragraphs [0026-27]), a measuring current between said head and said storage medium with said current measurement device (*see e.g.*, paragraphs [0026-27]), and determining that said head has too low of a flying height based on said current measurement (*see e.g.*, paragraphs [0033], lines 2-5), wherein said current measurement device is an ammeter/voltage source (*see e.g.*, paragraph [0028], line 1).

The embodiment of claim 16 generally describes a method of determining glide height characteristics for a disk drive comprising coupling a current measurement device (*see e.g.*, paragraph [0025] – Figure 3, element 309) to a glide head of a head gimbal assembly (*see e.g.*, paragraph [0026] – Figure 3, element 305), coupling said current measurement device to a said storage medium (*see e.g.*, paragraph [0027] – Figure 3, element 303), measuring current between said head and said storage medium with said current measurement device (*see e.g.*, paragraphs [0026-27]), and determining presence of disk asperities based on said current measurement (*see e.g.*, paragraphs [0031]), wherein said current measurement device is an ammeter/voltage source (*see e.g.*, paragraph [0028], line 1).

The embodiment of claim 17 generally describes a method of controlling flying height of a magnetic head in a disk drive comprising coupling an ammeter/voltage source (*see e.g.*,

paragraph [0025] – Figure 3, element 309) to the magnetic head of a head gimbal assembly (*see e.g.*, paragraph [0026] – Figure 3, element 305), coupling said ammeter/voltage source to a rotating magnetic storage medium (*see e.g.*, paragraph [0027] – Figure 3, element 303), applying voltage to said magnetic head (*see e.g.*, paragraph [0029], line 4), measuring current between said head and said storage medium with said ammeter/voltage source(*see e.g.*, paragraph [0029]), and adjusting an amount of applied voltage to said magnetic head based on said measure current (paragraph [0029], line 1-2), wherein said current measurement device is an ammeter/voltage source (*see e.g.*, paragraph [0028], line 1).

## **6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

**A.** Claims 1-5, 8-11, 13-15 and 17 are rejected under 35 U.S.C. §102(b) as being anticipated by Muranushi et al. (U.S. Patent No. 5,153,785), hereinafter “Muranushi”.

**B.** Claims 16 is rejected under 35 U.S.C. §102(b) as being anticipated by Frater et al. (U.S. Patent No. 4,479,090), hereinafter “Frater”.

**C.** Claims 6 and 12 are rejected under 35 U.S.C. §103(a) as being rendered obvious by Muranushi in view of Fraser.

## **7. ARGUMENT**

**A.** Claims 1-5, 8-11, 13-15 and 17 are not anticipated under 35 U.S.C. §102(b) by Muranushi.

Appellants submit the cited references do not teach or suggest at least “[an] apparatus, comprising: a current measurement device...wherein said current measurement device is an

ammeter/voltage source” (e.g., as described in claim 1).

The Examiner asserts Muranushi describes a current measurement device comprising a voltage source to supply power to a magnetic head, citing Figure 7, elements 1-5 and disclosure thereof. See Office Action dated 10/12/2007, page 2. Appellants disagree.

Figure 7, and its description, describes element 4 as a “current measuring device” and element 5 as a “voltage source”. See e.g., column 6, line 54 – column 7, line 24. As illustrated in Figure 7, the current measurement device (element 4) is separate and distinct from voltage source (element 5). Moreover, the description of Muranushi affirms this as well:

Provided on the magnetic head carrier 2 on its surface confronting the magnetic, disk 3 is a field electron emission electrode section 1, which is connected to a current measuring device 4 disposed in a proper location in the magnetic disk drive unit. *The current measuring device 4 is supplied with a voltage by being connected to one terminal of a constant voltage source 5, which has another terminal connected to a rotary joint 13 fitted on the spindle 12.* Both of the current measuring device 4 and voltage source 5 are connected to a computation processor 6 so that they can exchange data with each other. (*emphasis added*)  
See column 6, line 64 – column 7, line 7.

Contrary to the Examiner’s assertion, element 4 is not “part of” element 5, and nowhere is the teaching or suggestion that they are the same or one is included as part of the other element. Appellants submit the cited Figure 7 (and its description) fails to teach or suggest at least a current measurement device that is an ammeter/voltage source.

**B.** Claim 16 is rejected under 35 U.S.C. §102(b) as being anticipated by Frater et al. (U.S. Patent No. 4,479,090), hereinafter “Frater”.

First, Applicants note that the Final Office Action includes a §102 rejection of claim 16 based on Fraser, but does not include a citation of any kind or support the rejection in any way

with regard to at least the limitation “...wherein the current measurement device.” *See* Office Action dated 10/12/2007, page 3. Indeed, this limitation is not addressed at all. In order to support a proper §102 rejection, each and every limitation of the claim must be taught in the cited reference. The current rejection of claim 16 fails to do so. Therefore, it is lacking and should be withdrawn.

Regardless, Frater fails teach the relevant limitations as well. Frater is directed to measuring characteristics of a magnetic recording head which is flying in an air bearing relationship over a rotating magnetic recording disk. It fails to teach or describe at least a current measurement device that is an ammeter/voltage source. *See e.g.*, Figures 2A, 2B, 3, 4, 5.

C. Claims 6 and 12 are not rendered obvious by Muranushi in view of Fraser.

As discussed above, Fraser fails to make up for the deficiencies of Maranushi. Therefore, Appellants submit that since neither of the cited references teach, suggest or describe each and every limitation of claim 1, the current rejection is inadequate and should be withdrawn, and claim 1 should be allowed. Independent claims 3, 9 and 15-17 contain similar allowable subject matter, and therefore are allowable as well. Claims 2, 4-6, 8-14 are allowable for depending from allowable base claims.

## CONCLUSION

Appellants therefore respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner’s decision rejecting claims 1-6 and 8-17.

The Examiner is hereby authorized to charge the appeal brief fee of **\$510.00** and any additional fees which may be necessary for consideration of this paper to Kenyon & Kenyon Deposit Account No. **11-0600**.

Respectfully submitted,

KENYON & KENYON LLP

Date: April 14, 2008

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## **APPENDIX**

(Brief of Appellants Xiaofeng Zhang et al.  
U.S. Patent Application Serial No. 10/775,658)

The claims in their current form (including those claims under appeal) are listed below:

### **8. CLAIMS ON APPEAL**

1. An apparatus, comprising:  
a current measurement device;  
a head gimbal assembly including a head to at least one of read and write information signals from/to a moving storage medium, said current measurement device electrically coupled to said head and said storage medium; and  
said current measurement device is to measure current between said head and said storage medium wherein said current measurement device is an ammeter/voltage source.
2. The apparatus of claim 1 wherein said head is a magnetic head/slider.
3. An apparatus to measure contact between a magnetic recording head and a storage medium, comprising:  
a current measurement device;  
a head gimbal assembly including a magnetic recording head, said recording head electrically coupled to said current measurement device; and  
a storage medium coupled to said current measurement device; and

said current measurement device to measure current between said magnetic recording head and said storage medium wherein said current measurement device is an ammeter/voltage source.

4. The apparatus of claim 3 wherein said storage medium is a rotating magnetic storage disk.

5. The apparatus of claim 4 wherein said magnetic storage disk is coupled to a spindle and said spindle is coupled to said current measurement device.

6. The apparatus of claim 5 wherein said current measurement device is a current amplifier.

7. (Cancelled).

8. The apparatus of claim 7 wherein said ammeter/voltage source is to supply voltage to said magnetic recording head.

9. A method of measuring current, comprising:

coupling a current measurement device to a head of a head gimbal assembly, said head to at least one of read and write information signals from/to a moving storage medium;

coupling said current measurement device to a said storage medium; and

measuring current between said head and said storage medium with said current measurement device wherein said current measurement device is an ammeter/voltage source.

10. The method of claim 9 wherein said head is a magnetic recording head/slider and said storage medium is a magnetic storage disk.

11. The method of 10 wherein said magnetic storage disk is coupled to a spindle and said current measurement device is coupled to said spindle.

12. The method of claim 11 wherein said current measurement device is a current amplifier.

13. The method of claim 11 wherein said current measurement device is an ammeter/voltage source.

14. The method of claim 13 further comprising:  
applying voltage to said magnetic recording head with said ammeter/voltage source.

15. A method of determining flying height characteristics for a disk drive comprising:  
coupling a current measurement device to a head of a head gimbal assembly, said head to at least one of read and write information signals from/to a moving storage medium;  
coupling said current measurement device to a said storage medium;

measuring current between said head and said storage medium with said current measurement device; and

determining that said head has too low of a flying height based on said current measurement wherein said current measurement device is an ammeter/voltage source.

16. A method of determining glide height characteristics for a disk drive comprising:  
coupling a current measurement device to a glide head of a head gimbal assembly;  
coupling said current measurement device to a said storage medium;  
measuring current between said head and said storage medium with said current measurement device; and

determining presence of disk asperities based on said current measurement wherein said current measurement device is an ammeter/voltage source.

17. A method of controlling flying height of a magnetic head in a disk drive comprising:  
coupling an ammeter/voltage source to the magnetic head of a head gimbal assembly;  
coupling said ammeter/voltage source to a rotating magnetic storage medium;  
applying voltage to said magnetic head;  
measuring current between said head and said storage medium with said ammeter/voltage source; and

adjusting an amount of applied voltage to said magnetic head based on said measure current wherein said current measurement device is an ammeter/voltage source.

9. **EVIDENCE APPENDIX**

No further evidence has been submitted with this Appeal Brief.

**10. RELATED PROCEEDINGS APPENDIX**

Per Section 2 above, there are no related proceedings to the present Appeal.